COSATI SUBJECT CATEGORY LIST

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FOREWORD

The Subject Category List presented herein has been endorsed by the Committee on Scientific and Technical Information (COSATI) of the Federal Council on Science and Technology, as a uniform subject arrangement for 1) the announcement and distribution of scientific and technical reports which are issued or sponsored by Executive Branch Agencies, and 2) for management reporting. The List is a two-level arrangement consisting of 22 major subject fields with a further subdivision of the fields into 178 groups. Scope notes are included for each group.

Abstracts, citations and the like, for announcement purposes, can be gathered into these broad subject fields or groups for display to the user. For distribution purposes, these fields or groups may likewise be employed. Similarly, the fields or groups may be useful for arranging projects, tasks, or programs for management reporting purposes.

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The Task Group will now devote its efforts to the establishment of rules or guidelines for the development of vocabulary terms, and to develop a common vocabulary or thesaurus for indexing.

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Field and Group Structure

01 Aeronautics

A. Aerodynamics
B. Aeronautics
C. Aircraft
D. Aircraft flight control and instrumentation
E. Air facilities

02 Agriculture

A. Agricultural chemistry
B. Agricultural economics
C. Agricultural engineering
D. Agronomy and horticulture
E. Animal husbandry
F. Forestry

03 Astronomy and Astrophysics

A. Astronomy
B. Astrophysics
C. Celestial mechanics

04 Atmospheric Sciences

A. Atmospheric physics
B. Meteorology

05 Behavioral and Social Sciences

A. Administration and management
B. Documentation and information technology
C. Economics
D. History, law and political science
E. Human factors engineering
F. Humanities
G. Linguistics
H. Man-machine relations
I. Personnel selection, training and evaluation
J. Psychology (Individual and group behavior)
K. Sociology

06 Biological and Medical Sciences

A. Biochemistry
B. Bioengineering
C. Biology

D. Bionics
E. Clinical medicine
F. Environmental biology
G. Escape, rescue and survival
H. Food
I. Hygiene and sanitation
J. Industrial (occupational) medicine
K. Life support
L. Medical and hospital equipment
M. Microbiology
N. Personnel selection and maintenance (medical)
O. Pharmacology
P. Physiology
Q. Protective equipment
R. Radiobiology
S. Stress physiology
T. Toxicology
U. Weapon effects

07 Chemistry

A. Chemical engineering
B. Inorganic chemistry
C. Organic chemistry
D. Physical chemistry
E. Radio and radiation chemistry

08 Earth Sciences and Oceanography

A. Biological oceanography
B. Cartography
C. Dynamic oceanography
D. Geochemistry
E. Geodesy
F. Geography
G. Geology and mineralogy
H. Hydrology and limnology
I. Mining engineering
J. Physical oceanography
K. Seismology
L. Snow, ice and permafrost
M. Soil mechanics
N. Terrestrial magnetism

09 Electronics and Electrical Engineering

A. Components
B. Computers
C. Electronic and electrical engineering
D. Information theory
E. Subsystems
F. Telemetry

10 Energy Conversion (Non-propulsive)

A. Conversion techniques
B. Power sources
C. Energy storage

11 Materials

A. Adhesives and seals
B. Ceramics, refractories and glasses
C. Coatings, colorants and finishes
D. Composite materials
E. Fibers and textiles
F. Metallurgy and metallography
G. Miscellaneous materials
H. Oils, lubricants, and hydraulic fluids
I. Plastics
J. Rubbers
K. Solvents, cleaners and abrasives
L. Wood and paper products

12 Mathematical Sciences

A. Mathematics and statistics
B. Operations research

13 Mechanical, Industrial, Civil, and Marine Engineering

A. Air conditioning, heating, lighting and ventilating
B. Civil engineering
C. Construction equipment, materials and supplies
D. Containers and packaging
E. Couplings, fittings, fasteners and joints
F. Ground transportation equipment
G. Hydraulic and pneumatic equipment
H. Industrial processes
I. Machinery and tools
J. Marine engineering
K. Pumps, filters, pipes, fittings, tubing and valves
L. Safety engineering
M. Structural engineering

14 Methods and Equipment

A. Cost effectiveness
B. Laboratories, test facilities, and test equipment
C. Recording devices
D. Reliability
E. Reprography

15 Military Sciences

A. Antisubmarine warfare
B. Chemical, biological, and radiological warfare
C. Defense
D. Intelligence
E. Logistics
F. Nuclear warfare
G. Operations, strategy, and tactics

16 Missile Technology

A. Missile launching and ground support
B. Missile trajectories
C. Missile warheads and fuses
D. Missiles

17 Navigation, Communications, Detection and Countermeasures

A. Acoustic detection
B. Communications
C. Direction finding
D. Electromagnetic and acoustic countermeasures
E. Infrared and ultraviolet detection
F. Magnetic detection
G. Navigation and guidance
H. Optical detection
I. Radar detection
J. Seismic detection

18 Nuclear Science and Technology

A. Fusion devices (Thermonuclear)
B. Isotopes
C. Nuclear explosions
D. Nuclear instrumentation
E. Nuclear power plants
F. Radiation shielding and protection
G. Radioactive wastes and fission products
H. Radioactivity

I. Reactor engineering and operation
J. Reactor materials
K. Reactor physics
L. Reactors (Power)
M. Reactors (Non-power)
N. SNAP technology

19 Ordnance

A. Ammunition, explosives, and pyrotechnics
B. Bombs
C. Combat vehicles
D. Explosions, ballistics, and armor
E. Fire control and bombing systems
F. Guns
G. Rockets
H. Underwater ordnance

20 Physics

A. Acoustics
B. Crystallography
C. Electricity and magnetism
D. Fluid mechanics
E. Masers and lasers
F. Optics
G. Particle accelerators
H. Particle physics
I. Plasma physics
J. Quantum theory
K. Solid mechanics
L. Solid-state physics
M. Thermodynamics
N. Wave propagation

21 Propulsion and Fuels

A. Air-breathing engines
B. Combustion and ignition
C. Electric propulsion
D. Fuels
E. Jet and gas turbine engines
F. Nuclear propulsion
G. Reciprocating engines
H. Rocket motors and engines
I. Rocket propellants

22 Space Technology

A. Astronautics
B. Spacecraft
C. Spacecraft trajectories and reentry
D. Spacecraft launch vehicles and ground support

01 AERONAUTICS

Theory, design, tests, production, operation, and maintenance of all types of aircraft, aircraft components, and supporting facilities. For similar studies of missiles or spacecraft, see Missile Technology (Field 16) or Space Technology (Field 22).

GROUP	SCOPE
A. Aerodynamics	Theoretical and experimental studies of the motions of gases and of forces acting on bodies in motion relative to gases. Subsonics, transonics, supersonics, hypersonics, thermoaerodynamics, shock waves, Reynolds number effects, Mach number effects, boundary layer phenomena, etc. For applications, see Aircraft (1/C), Explosions, ballistics, and armor (19/D), Missiles (16/D), and Spacecraft (22/B). See also Plasma physics (20/I).
B. Aeronautics	Aircraft operation and flight studies, including all-weather and night flight, in-flight refueling, taxiing, takeoffs, landings, air traffic, flight safety, ground safety, and aircraft accidents. Aircraft damage assessment and vulnerability studies; effects of gunfire and blast on aircraft and flight equipment.
C. Aircraft	Design, production, and maintenance of aircraft, aircraft components and equipment, including gliders, lighter-than-air craft, rotating wing and waterborne aircraft, ground effect machines, flexible-wing, VTOL and STOL planes. Structural studies of complete aircraft parts such as bodies, wings, control surfaces, landing gear, and airframes.
D. Aircraft flight control and instrumentation	Stability and control systems, boundary layer control systems, dynamic and static control devices, flight instruments, etc. For navigation instruments, see Navigation and guidance (17/G).
E. Air facilities	Airports, runways, hangars, control towers, refueling systems, aircraft handling and maintenance equipment. For air traffic control systems, see Navigation and guidance (17/G).

02 AGRICULTURE

GROUP	SCOPE
A. Agricultural chemistry	Utilization of agricultural products by chemical processing; chemical aspects of feeds, fertilizers, etc. Chemurgy.
B. Agricultural economics	Economic conditions, markets, production controls, subsidies, etc. affecting agriculture.
C. Agricultural engineering	Design of farm machinery and farm structures. Soil conservation, water conservation, and irrigation. Processing of farm products.
D. Agronomy and horticulture	Field crop production, cultivation of orchards, gardens, nurseries, etc. For plant anatomy, biochemistry, pathology, etc., see Biology (6/C).
E. Animal husbandry	Production and care of domestic animals, such as bovines, sheep, goats, horses, and swine; domestic animals used as pets. Includes veterinary medicine. For animal anatomy, physiology, pathology, etc., see Biology (6/C). For care and breeding of laboratory animals, see Biology (6/C).
F. Forestry	Development, management, and cultivation of forests.

03 ASTRONOMY AND ASTROPHYSICS

GROUP	SCOPE
A. Astronomy	Observations of celestial bodies, their distances, positions, etc. Astronomical instruments.
B. Astrophysics	Physical and chemical aspects of celestial bodies, their origin and evolution. Includes astronomical spectroscopy, stellar spectra, planetary spectra, etc.
C. Celestial mechanics	The motions of celestial bodies under the influence of gravity.

04 ATMOSPHERIC SCIENCES

GROUP	SCOPE
A. Atmospheric physics	Physical and chemical properties of the atmosphere, exclusive of considerations of weather and climate. Aeronomy, aurora and airglow, atmospheric structure, energetic particles, solar terrestrial relationships, etc.
B. Meteorology	Weather observation, prediction, and modification; climatology. Cloud physics, air mass analysis, meteorological instruments, etc.

05 BEHAVIORAL AND SOCIAL SCIENCES

GROUP	SCOPE
A. Administration and management	Accounting, planning, budgeting, operations, public relations, production planning, organization coordination, etc. See also Cost effectiveness (14/A) and Operations research (12/B).
B. Documentation and information technology	Library science. Acquisition, distribution, dissemination of recorded information, including printed matter, microforms, magnetic tapes and records. Cataloging, indexing, abstracting. Information storage and retrieval. Terminology, dictionaries, thesauri. See also Linguistics (5/G).
C. Economics	Econometrics, economic history, economic theory, banking and finance, international economic relations, trade and commerce. See also Agricultural economics (2/B).
D. History, law and political science	Theory and practice of government, international relations, politics, law, etc.
E. Human factors engineering	Design of tools, instruments, equipment, and machinery with emphasis on optimum utilization by humans. Habitability of work and living space, noise control, temperature and humidity control, etc.
F. Humanities	Philosophy, literature, art, music, drama, religion, and other branches of learning having primarily a cultural character.
G. Linguistics	Study of languages, including phonology, morphology, syntax, and semantics. Mathematical linguistics. Machine translation.
H. Man-machine relations	Interaction of man and equipment in terms of subsystem and system performance requirements and evaluation. Encompasses manual controls, information displays, information processing, tactical kinethesis and other human sensory modalities involved in operation of equipment and understanding of personnel subsystems.

GROUP		SCOPE
I.	Personnel selection, training, and evaluation	Recruitment, selection, training, and utilization of personnel. Industrial relations, wages, benefits. Education, teaching aids, teaching methods. Job analysis, career guidance. For physical examinations, see Personnel selection and maintenance (Medical) (6/N).
J.	Psychology (Individual and group behavior)	Mental processes and phenomena (perception, learning, behavior, motivation, intelligence and creativity, attitudes, personality adjustment, group dynamics, etc.) Experimental psychology, including animal learning and behavior; physiological psychology, developmental psychology (infancy through aging); social psychology, clinical psychology, educational psychology, industrial and military psychology, and parapsychology. For psychiatry, see Clinical medicine (6/E). For psychopharmacology, see Pharmacology (6/0).
K.	Sociology	Social relations, the functioning of human society, ethnology, criminology, etc.

06 BIOLOGICAL AND MEDICAL SCIENCES

GROUP	SCOPE
A. Biochemistry	Reactions and properties of chemical substances occurring in organisms (e.g., enzymes, hormones, lipids, vitamins). Includes alkaloids, steroids, carbohydrates, amino acids, peptides and proteins. Studies of the chemical processes which take place in biological systems. Identification, characterization, and measurement of biochemical substances and the methods used for biochemical assay and analysis. For biochemical studies of drugs, see Pharmacology. See also Organic chemistry (7/C).
B. Bioengineering	Establishment of requirements for, and development of, bio-instrumentation and equipment needed by man in operation of man-machine systems. Includes instrumentation for psychophysiological monitoring, biomedical information handling. Compact, lightweight transducers and transmitter equipment introducing minimum constraint of subject. Man's requirements for displays and controls. Use of body potentials as intrinsic power supplies.
C. Biology	General studies in biology not encompassed by another group, e.g. botany, entomology, zoology. Animal anatomy, physiology and pathology; care and breeding of laboratory animals.
D. Bionics	Study of biological processes in order to develop engineering systems. Cybernetics.
E. Clinical medicine	General medicine, medical specialities, and paramedical sciences. Internal medicine, including preventive medicine; pediatrics and geriatrics, dermatology, ophthalmology, and psychiatry. Dentistry. Immunology, pathology, etc. Includes nursing, first aid, medical technology, physical therapy, and prosthesis. For pharmaceutics, see Pharmacology (6/0). For veterinary medicine, see Animal husbandry (2/E). For aerospace medicine, see Stress physiology (6/S).

GROUP		SCOPE
F.	Environmental biology	External influences on the biological processes of organisms; ecology, pesticides, insect vectors, pest control, natural noxious agents, etc. See also Stress physiology (6/S).
G.	Escape, rescue, and survival	Methods and equipment for escape from disabled aircraft, submarines, etc. Rescue equipment, signals, flotation devices; survival kits.
H.	Food	Preparation and processing, packaging, storage and dispensing of food. Kitchen equipment.
I.	Hygiene and sanitation	Personal hygiene. For sanitary engineering, see Civil engineering (13/B).
J.	Industrial (occupational) medicine	Interaction of man and industrial environment. Safety and preventive medicine, toxic exposure, noise, physical trauma, etc.
K.	Life support	Sustainment of life in foreign environments. Closed ecological systems; respiratory support; temperature, humidity, and pressure controls.
L.	Medical and hospital equipment and supplies	Equipment and supplies for laboratory and field use. See also Bioengineering (6/B).
M.	Microbiology	Studies of bacteria, rickettsiae, and viruses. For further studies of the effects of microorganisms, see Chemical, Biological, and Radiological Warfare (15/B).
N.	Personnel selection and maintenance (Medical)	Physical standards, examinations, anthropometrics, physical fitness. See also Personnel selection, training, and evaluation (5/I).
O.	Pharmacology	The synthesis, composition, properties, and physiological effects of drugs. Includes psychopharmacology. See also Weapon effects (6/U).

GROUP	SCOPE
Physiology	Organic processes and phenomena of humans, e.g., growth, aging, metabolism, biological rhythm, healing and repair, sensation, etc. See also Stress physiology (6/S). For physiological psychology, see Psychology (5/J).
Protective equipment	Protective clothing; goggles, ear protectors, masks, etc. For armor, see Explosions, ballistics, and armor (19/D). See also Chemical, biological, and radiological warfare (15/B) and Radiation shielding and protection (18/F).
Radiobiology	Radiation biology. Interaction of biological systems with electromagnetic and particle radiation. Dosimetry, health physics, radiation injury. Prophylaxis and therapy of nuclear radiation sickness and injury.
Stress physiology	Effects of extreme environments or unusual stimulation on biological processes. Physiological effects of motion, gravity, sound, light, heat, magnetism, sensory deprivation, fatigue, etc. Includes aerospace medicine. For effects of ionizing and particle radiation, see Radiobiology (6/R).
Toxicology	Poisons and contaminants: detection, neutralization, and decontamination; physiological effects.
Weapon effects	Wounds, injuries, diseases or other conditions directly resulting from weapons. Excludes effects of Chemical, biological, and radiological warfare (15/B) and Nuclear warfare (15/F). For bombing effects, see Explosions, ballistics and armor (19/D).

07 CHEMISTRY

GROUP	SCOPE
A. Chemical engineering	Plant equipment, apparatus, techniques, unit operations and processes that apply to chemical manufacturing, processing, transportation, and storage. Desalination.
B. Inorganic chemistry	Reactions and properties of all the elements and their compounds, with the exception of carbon-hydrogen compounds. Inorganic synthesis. Inorganic qualitative and quantitative analysis, including analysis of inorganic chemicals by physical methods (instrumental analysis); identification and characterization of elements and inorganic compounds by means of their spectra. Includes inorganic polymers, coordination compounds, metal chelates, metal carbonyls, and metal ion complexes such as ammines. For organometallic compounds <u>see</u> Organic chemistry (7/C).
C. Organic chemistry	Synthesis, reactions, and properties of organic compounds. Hydrocarbons, alcohols, aldehydes and ketones, carboxylic acids, amines, etc. Chemistry of dyes. Heterocyclic compounds, organometallic compounds, organometalloidal compounds, semiorganic compounds, terpenes. Synthesis of polymers, excluding high polymers such as Rubbers (11/J) and Plastics (11/I). Organic qualitative and quantitative analysis, including the analysis of organic compounds by physical methods; characterization and determination of organic compounds by means of their spectra. <u>See also</u> Biochemistry (6/A)
D. Physical chemistry	Physical aspects and theoretical interpretations of chemical systems. Colloid chemistry, catalysis, solutions, chemical equilibria and reaction kinetics, surface chemistry, electrochemistry, chemical thermodynamics and thermochemistry, statistical mechanics, etc. Includes physical methods of analysis not applied exclusively to specific Groups of chemical substances. General treatments of chromatography,

GROUP	SCOPE
	electrophoresis, polarography, photometry, potentiometry. Includes atomic and molecular structure and spectra. X-ray, ultraviolet, visible, infrared, and microwave spectra; vibronic spectra, and Raman spectra for the fundamental understanding of chemical binding, nuclear motions, etc; vibrational frequencies, rotational frequencies, force constants, pressure broadening, solvent shifts, etc. Includes nuclear magnetic resonance spectroscopy and electron paramagnetic resonance spectroscopy. Excludes the qualitative and quantitative analysis of chemical substances by means of their spectra, for which see Inorganic chemistry (7/B) or Organic chemistry (7/C). See also Optics (20/F) and Thermodynamics (20/M).
Radio and radiation chemistry	Chemistry of the effects of high-energy radiation on matter. Chemical effects of emanations from radioactivity and fission (helium nuclei, electrons, gamma rays, and neutrons). Chemistry of radioactive substances. Tracer studies. Includes photochemistry (i.e. study of interrelationships between light and chemical reactions, especially visible and ultraviolet light). Photosynthesis, photodecomposition and photolysis, photopolymerization, etc.

08 EARTH SCIENCES AND OCEANOGRAPHY

GROUP		SCOPE
A.	Biological oceanography	Marine and animal life as it relates to its environment.
B.	Cartography	Map making, photogrammetry, terrain models, etc.
C.	Dynamic oceanography	Ocean waves, currents, tides, ocean air interactions, etc.
D.	Geochemistry	Chemical properties of the earth's crust.
E.	Geodesy	Geodetic surveying; determination of position of points on the earth's surface; shape and size of the earth; variations of terrestrial gravity and magnetism.
F.	Geography	Description of the physical features of the earth, the distribution of plants and animals. Includes political, economic, and commercial geography.
G.	Geology and mineralogy	Structures, properties, and classification of rocks, rock formations, and rock constituents. Mineralogy, paleontology, stratigraphy.
H.	Hydrology and limnology	Properties, distribution, and circulation of water, including its surface, underground, and atmospheric occurrence. Physical, chemical and biological conditions in fresh water bodies. For water purification, see Civil engineering (13/B). See also Meteorology (4/B).
I.	Mining engineering	Location and evaluation of mineral deposits; layout and equipment of mines, mining operations.
J.	Physical oceanography	Physical and chemical properties of ocean water. Topography and composition of the ocean bottom.
K.	Seismology	Detection, measurement, and recording of earth movements. See also Seismic detection (17/J).
L.	Snow, ice, and permafrost	Physical characteristics of snow, ice, and permanently frozen soil. Trafficability, stability, mechanical properties, etc.

GROUP	SCOPE
Soil mechanics	Physical properties of soils. See also Snow, ice, and permafrost (8/L).
Terrestrial magnetism	Geomagnetic field theory, magnetic moments of the earth, gravitational field theory, gravity anomalies, etc.

09 ELECTRONICS AND ELECTRICAL ENGINEERING

GROUP	SCOPE
A. Components	Design and development of basic electrical and electronic components such as electron tubes and semiconductor devices (diodes, transistors, thermistors, varistors, thin-film devices, etc.) Switches, circuits, connectors, etc.
B. Computers	Design, development, and application of electronic computers and peripheral equipment. Includes analog, digital, analog-digital, special purpose and general purpose computers; computer accessories, supplies, and installation; computer software such as programs, programming languages, program generators, compilers, executive routines, and system evaluation and documentation.
C. Electronic and electrical engineering	Design and operation of electric machinery. Electronic systems, exclusive of those encompassed by Field 17. Includes electrical and electronic test equipment. See also Nuclear power plants (18/E) and Energy conversion (Field 10).
D. Information theory	Representation, uncertainty, noise, information content, information entropy, coding theory.
E. Subsystems	Design and development of electrical and electronic devices that are usually aggregates of components, but do not in themselves constitute complete systems. Includes synchros, servomechanisms, etc.
F. Telemetry	Telemetry equipment, including antennas, receivers, transmitters, etc.

10 ENERGY CONVERSION (Non-Propulsive)

GROUP	SCOPE
A. Conversion techniques	Methods and devices capable of being used in the conversion of energy from one form to another. Turbo-machinery, photovoltaic devices, thermoelectric generators, thermionic converters, fuel cells, etc.
B. Power sources	Energy source and conversion device capable of supplying controlled power in some useful form. Radioisotope thermoelectric generator, solar concentrator with thermionic generator, nuclear reactor with thermoelectric converter.
C. Energy storage	The storage of energy for later recovery in a useful manner. Electrochemical devices such as batteries, thermal energy in the heat of fusion, mechanical energy of compressed springs, electrical energy in capacitors, etc.

11 MATERIALS

GROUP	SCOPE
A. Adhesives and seals	Adhesives, glues, binders, etc., for all types of materials. Sealants, seals, and gaskets for all purposes. For propellant binders, see Rocket propellants (21/I).
B. Ceramics, refractories, and glasses	Ceramic materials, including glasses, brick, porcelain, tiles, etc. Nonmetallic refractory materials. Cermets. For heat-resistant metals and alloys, see Metallurgy and metallography (11/F).
C. Coatings, colorants, and finishes	Paints, paint primers, varnishes, plastic and rubber coatings. Uses of dyes and pigments. For chemistry of dyes, see Organic chemistry (7/C). For metal coatings, see Metallurgy and Metallography (11/F).
D. Composite materials	Materials composed of two or more physically distinct constituents. For reinforced plastics, see Plastics (11/I).
E. Fibers and textiles	Natural and synthetic fibers, threads, yarns, and textiles.
F. Metallurgy and metallography	Refining and production of metals and alloys. Microstructure, physical and mechanical properties, corrosion studies, etc. Metal coatings. Heat-resistant metals and alloys (the refractory metals or alloys designed for use above 1000°C). Includes extractive and physical metallurgy. For fabrication metallurgy (metal forming), see Industrial processes (13/H).
G. Miscellaneous materials	Materials not included in another group, including leather, fur, and other animal products. Refrigerants, straw, waxes, etc.
H. Oils, lubricants, and hydraulic fluids	Properties, performance, and production of all types of oils, lubricants, and hydraulic fluids.

11 MATERIALS (Cont)

GROUP	SCOPE
I. Plastics	Properties, performance, and production of all types of plastics and resins; reinforced plastics and laminates. For plastic coatings, see Coatings, colorants and finishes (11/C). For synthetic fibers and textiles, see Fibers and textiles (11/E).
J. Rubbers	Production, performance, and properties of natural and synthetic rubber and rubber products. Elastomers.
K. Solvents, cleaners, and abrasives	Cleaning compositions, solvents, detergents, soaps, abrasives, etc.
L. Wood and paper products	Wood, wood products, paper, cardboard, converted products, etc.

12 MATHEMATICAL SCIENCES

GROUP	SCOPE
A. Mathematics and statistics	Mathematics and statistics research. For applied mathematics, see the specific application. For mathematical linguistics, see Linguistics (5/G).
B. Operations research	Theoretical operations research. For applied techniques, see the specific application.

13 MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

GROUP	SCOPE
A. Air conditioning, heating, lighting, and ventilating	Heating systems, heat pumps, boilers, furnaces, radiators, convectors. Exhaust systems, fans, ventilators and ventilation, heat removal. Air conditioning systems, refrigeration systems, cold storage systems, lighting systems.
B. Civil engineering	Sources of water supply, water collection, well drilling, water distribution, and flood control. Urban planning and renewal, highway planning, public utilities, etc. Sanitation, waste disposal, water treatment and purification, sewage treatment and disposal, air and water pollution control. Sanitary engineering. For distribution and circulation of water, especially natural water, at the surface of the earth, see Hydrology and limnology (8/H). See also Structural engineering (13/M).
C. Construction equipment, materials, and supplies	Excavation and earth moving equipment, hoisting and conveying equipment, construction equipment. Building materials and supplies.
D. Containers and packaging	Design, production, performance, and testing of containers and packaging methods. Storage tanks and accessories.
E. Couplings, fittings, fasteners, and joints	Design, performance, and testing of bolts, screws, studs, rivets, hooks, couplings, fittings. Bonded, soldered, and welded joints, etc. For electrical fittings and connectors, see Electronic and electrical engineering (9/C).
F. Ground transportation equipment	Design, operation, performance, and maintenance of amphibious vehicles, cargo vehicles, passenger vehicles, railroad equipment, automotive parts and equipment. For armored vehicles designed specifically for combat, see Combat vehicles (19/C).
G. Hydraulic and pneumatic equipment	Design, production, performance, and testing of hydraulic and pneumatic systems. Accumulators, distribution equipment, acutuators and motors, controls and components.

GROUP	SCOPE
H. Industrial processes	Production control, quality control, plant design, inspection. Fabrication, cleaning and finishing, etc. of industrial materials. Includes fabrication metallurgy (metal forming): casting, forging, drawing, electroforming, extrusion, machining, rolling, stamping, spinning, welding; powder and fiber metallurgy. Cast and fused metals, foils, wire, wire cloth, etc. For Food processing, see Food (6/H).
I. Machinery and tools	Machines and machine elements, including bearings, clutches, drives, gears, cams, springs, etc. Metal-working tools, woodworking tools, dies, jigs, etc. For electrical machinery, see Electronic and electrical engineering (9/C).
J. Marine engineering	Design, construction, maintenance, salvage, operation, and performance of all types of ships, boats, and marine equipment.
K. Pumps, filters, pipes, tubing, fittings, and valves	Design, construction, operation, and performance of all types of pumps, filters, pipes, tubes, and valves.
L. Safety engineering	Fire-fighting equipment, fire-detection equipment, accident prevention, safety devices. For protective clothing, etc., see Protective equipment (6/Q).
M. Structural engineering	Design and construction of structures. Dams, bridges, buildings, etc. Foundations, reinforcements, etc. See also Civil Engineering (13/B) and Construction equipment, materials, and supplies (13/C).

14 METHODS AND EQUIPMENT

GROUP	SCOPE
Cost effectiveness	Examination and selection of equipment, materials, personnel, etc. for optimum performance of given tasks. Cost-benefit analysis, trade-off factors, etc. See also Operations research (12/B) and Administration and management (5/A).
Laboratories, test facilities, and test equipment	Laboratory and test facility design; layout, construction, operation, maintenance, etc. Laboratory and testing devices, wind and water tunnels, simulation devices and facilities. Instrumentation. For electrical and electronic test equipment, see Electronic and electrical engineering (9/C). For optical equipment, see Optics (20/F).
Recording devices	Recording equipment, including wire and tape recorders, playback equipment, etc.
Reliability	Determination of the probability of satisfactory performance of components and equipment. Prevention and correction of malfunctions.
Reprography	Photographic techniques and equipment. Cameras, lenses, shutters, projectors, photographic processes, photographic materials, etc. Electrostatic reproduction, facsimile replication, photochromic replication, photoconductive replication, thermography, thermoplastic recording. Printing, lithography, and related equipment. For photogrammetry, see Geodesy (8/E).

15 MILITARY SCIENCES

GROUP	SCOPE
A. Antisubmarine warfare	Operations conducted against submarines, their supporting forces and operating bases. See also Navigation, Communications, Detection, and Countermeasures (Field 17).
B. Chemical, biological, and radiological warfare	Design, development, and utilization of chemical, biological, and radiological weapons. Description, production, generation, and stability of lethal and irritant agents. Nerve gases, psychochemical agents, choking gases, blistering gases, vomiting and tear gases, etc. Biological agents (toxic biological products, anticrop agents, plant growth regulators, etc.) Detection of chemical and biological agents; decontamination. Special shelters. Protective clothing and equipment. For guided missile warheads, see Missile warheads and fuzes (16/C).
C. Defense	Military and civil defense. Active and passive defense systems, camouflage. Antiaircraft defense systems, antimissile defense systems, antisatellite defense systems, early warning systems. *Development and use of* antiaircraft weapons.
D. Intelligence	Methods of collecting, evaluating, interpreting, and disseminating information concerning areas of operations of foreign nations.
E. Logistics	Industrial mobilization. Procurement, storage, distribution, issue, repair, and reclamation of equipment and supplies. Design and testing of personal equipment, ordinary combat clothing, packs, sleeping bags, boots, etc. Transport of troops, cargo maintenance, etc.
F. Nuclear warfare	Development and utilization of nuclear weapons. Design of nuclear devices. Studies of the physical and physiological effects of nuclear weapons. For guided missile warheads, see Missile warheads and fuzes (16/C).

15 MILITARY SCIENCES (Cont)

GROUP	SCOPE
. Operations, strategy, and tactics	Joint and combined operations. Campaigns, battles, invasions, theater operations, etc. Planning, analysis and appraisal. Methods of attack and support. See also Chemical, biological, and radiological warfare (15/B), Nuclear warfare (15/F), and Antisubmarine warfare (15/A).

16 MISSILE TECHNOLOGY

Theory, design, tests, production, operation, and maintenance of all types of guided missiles, missile components, and related equipment. For similar studies of spacecraft launch vehicles, see Space Technology (Field 22). For unguided rocket-propelled weapons, see Rockets (19/G).

GROUP	SCOPE
A. Missile launching and ground support	Missile handling and launching, including transportation, storage, preparation for launching, launching from aircraft, surface launching, and underwater launching. Launching equipment, checkout equipment, ground support equipment and systems.
B. Missile trajectories	Determination, analysis, and processing of missile trajectory data. Flight path analysis, impact prediction, etc. Reentry.
C. Missile warheads and fuzes	Design, performance, and operation of all warhead types including explosive, chemical, biological, and nuclear. Equipment installed in warheads for specialized research. Missile fuzes of all types.
D. Missiles	All phases of missile theory, design, construction, and performance. Aerodynamic studies, structural analysis, etc.

17 NAVIGATION, COMMUNICATIONS, DETECTION, AND COUNTERMEASURES

GROUP	SCOPE
Acoustic detection	Sonar, sound ranging, sound location equipment, etc.
Communications	Design, performance, operation and maintenance of telephone, telegraph, teletype, television, and radio communication systems. See also Electronic and electrical engineering (9/C).
Direction finding	Determination of the direction of arrival of signals.
Electromagnetic and acoustic countermeasures	Jamming and antijamming, interception, and deception, of acoustic and electromagnetic signals. Receivers, transmitters, decoys, etc. used in countermeasures.
Infrared and ultraviolet detection	Detection and tracking by measurement of the infrared or ultraviolet radiation from a target. Does not include the laboratory identification and characterization of specific chemical elements and compounds. See Inorganic chemistry (7/B) or Organic chemistry (7/C). For design and development of photodetectors of all types, see Optics (20/F).
Magnetic detection	Detection by measurement of the magnetic field of a target.
Navigation and guidance	Electronic, celestial, and inertial navigation and guidance systems and related equipment; homing devices. Includes Loran, Shoran, instrument landing systems, air traffic control systems, controlled approach systems, and navigational aids such as astrographs, chronometers, compasses, driftmeters, sextants, octants, air position indicators, graphic instruments, maps and charts.
Optical detection	Flash locating equipment, theodolites, periscopes, binoculars, telescopes, etc.

17 NAVIGATION, COMMUNICATIONS, DETECTION, AND COUNTERMEASURES (Cont)

GROUP	SCOPE
I. Radar detection	Detection and tracking by means of beamed and reflected radiofrequency signals.
J. Seismic detection	Detection of objects by measurement of seismic waves.

18 NUCLEAR SCIENCE AND TECHNOLOGY

GROUP	SCOPE
Fusion devices (Thermonuclear)	Theory, design, construction, or operation of specific devices (stellarators, pinch devices, magnetic mirror machines, etc.) used for research on controlled thermonuclear fusion reactions. For related plasma physics studies, see Plasma physics (20/I).
Isotopes	Separation or concentration of isotopes by any means. Industrial and medical applications. For isotopic SNAP applications, see SNAP technology.
Nuclear explosions	Testing of nuclear devices including peaceful applications, e.g., Plowshare. See also Nuclear warfare (15/F).
Nuclear instrumentation	Radiation detection devices and associated equipment; also instruments associated with the control, safety, or operation of nuclear reactors or particle accelerators.
Nuclear power plants	Integrated assemblage, including reactor and turbogenerator equipment, plus control and regulatory devices; safety studies. Includes mobile as well as stationary power plants.
Radiation shielding and protection	Shielding design, isodose plots, materials transmission and absorption studies, safety devices, decontamination, etc.
Radioactive wastes and fission products	Separation, processing, handling, storage, or disposal; fission product utilization. See also Isotopes (18/B).
Radioactivity	Radioactive decay, natural and induced radioactivity, interaction of charged particles and radiation with matter, radioactive fallout, fission, cirticality studies, etc. See also Particle physics (20/H) and Radio and radiation chemistry (7/E)
Reactor engineering and operation	Engineering of any type (construction, thermodynamic, hydrodynamic, nuclear, etc.) related directly to the design or operation of a specific reactor or reactor type.

18 NUCLEAR SCIENCE AND TECHNOLOGY (Cont)

GROUP	SCOPE
J. Reactor materials	Production, testing (either under reactor or simulated reactor conditions) or reclamation of fuel materials, coolants, moderators, control materials, structural materials and shielding materials. Includes fabricated elements or assemblies and specific configurations (plates, rods, spheres, cylinders, etc.)
K. Reactor physics	Reactor kinetics, reactor theory, criticality and neutron thermalization, scattering, slowing down, economy, etc. Includes the use of reactor simulators or computers.
L. Reactors (Power)	Design, construction, operation, etc., of reactors used as energy sources for electric power generation or for propulsion. See also Nuclear power plants (18/E).
M. Reactors (Non-power)	Reactors designed and built for purposes other than for electric power or propulsion. Includes production research and training, test, and process heat types. See also Nuclear propulsion (21/F).
N. SNAP technology	Systems for Nuclear Auxiliary Power, both isotopic and reactor. Design, construction, operation, safety, etc.

19 ORDNANCE

GROUP	SCOPE
A. Ammunition, explosives	Projectiles, fuzes, demolition explosives, detonators, grenades, land mines, high explosives, primers, powder propellants, ammunition shaped charges, flame throwers, ammunition handling equipment, etc. Production, performance, stability in storage, etc., of incendiaries, pyrotechnics, screening agents and smokes, etc.
B. Bombs	High-explosive, fragmentation, antipersonnel, armor piercing, general purpose, chemical bombs, etc. Bomb handling equipment.
C. Combat vehicles	Armored wheeled and track-laying vehicles for both cargo and personnel. Heavy, light and medium tanks. Tank chassis used as gun carriers, their components and accessories.
D. Explosions, ballistics, and armor	Shock waves, detonation, earth movement, penetration, etc. Effects of bombing, blast, heat, gunfire, ballistics, armor plate, body armor, etc. For nuclear explosions, see (18/C). See also Weapon effects (6/U).
E. Fire control and bombing systems	Computers, sights, directors, range finders, gun-laying and bombing radar systems, bomb releases, and other systems or devices used to direct the firing of any weapon.
F. Guns	Small arms, automatic weapons, recoilless weapons, mortars, artillery and naval guns, their components, accessories, and interior ballistics. Gun carriages, gun mounts, remote control equipment, etc.
G. Rockets	Rocket-propelled weapons, including aircraft, large caliber and shoulder-fired rockets and devices for launching.
H. Underwater ordnance	Torpedoes, submarine mines, depth charges hydrobombs, etc., and devices for launching.

20 PHYSICS

GROUP	SCOPE
A. Acoustics	Sound transmission and propagation, acoustic waves, ultrasonics, etc. Vibratory systems, pitch, intensity, frequency, damping, resonance, etc.
B. Crystallography	Structure and properties of crystalline forms. Lattices, impurities, etc.
C. Electricity and magnetism	Theory of electrical and magnetic phenomena. Electrostatics, electrodynamics, magnetodynamics, magnetostatics. For nuclear magnetic resonance spectroscopy, see Physical chemistry (7/D).
D. Fluid mechanics	Dynamics and statics of fluids, excluding Aerodynamics (1/A). Includes hydrodynamics and hydrostatics. See also Marine engineering (13/J) and Hydraulic and pneumatic equipment (13/G).
E. Masers and lasers	Microwave and light amplification devices, including irasers, uvasers, etc.
F. Optics	Generation, transmission, reflection, refraction, propagation and properties of electromagnetic radiation in the optical region of the spectrum (10 angstroms to about 1 mm) and extending into the microwave region. Physical and geometric optics, electron and microwave optics, fiber optics. Optical imaging, optical equipment. X-ray diffraction, neutron diffraction, etc. Techniques and design of apparatus for use in mass spectrometry and spectroscopy. Includes photodectors of all types: bolometers, radiometers, photomultipliers, etc. For radiofrequency spectroscopy, see Wave propagation (20/N). For precise laboratory identification and characterization of specific chemical substances by means of their spectra, see the appropriate Group under Chemistry (Field 7). For spectroscopy applied to atomic and molecular structure, see Physical chemistry (7/D). For the electromagnetic detection of gross substances and objects, see the appropriate Group under Navigation, Communications, Detection, and Countermeasures (Field 17). For astronomical spectroscopy, see Astrophysics (3/B).

GROUP	SCOPE
G. Particle accelerators	Design and operation of betatrons, bevatrons, cyclotrons, synchrotrons, etc.
H. Particle physics	Properties and reactions of elementary particles, especially subatomic particles (electrons, mesons, hyperons, etc., anti-particles). Nuclear reactions; cosmic rays. For atomic and molecular structure and spectra, see Physical chemistry (7/D).
I. Plasma physics	Theory and properties of plasmas, including magnetohydrodynamics, pinch effect, plasma oscillations, plasma jets, etc. See also Particle physics (20/H). For applications, see the appropriate field.
J. Quantum theory	Relativistic and nonrelativistic quantum theory, relativity theory, quantum mechanics and quantum statistics.
K. Solid-mechanics	Dynamics and statics of solid bodies. Structural mechanics; kinetics, kinematics, equilibria, stress analysis, buckling, elasticity, plasticity, vibrations, shock and impact, etc.
L. Solid-state physics	Studies of the structure and properties of solids, exclusive of those encompassed by Crystallography (20/B) and Metallurgy and metallography (11/F). Properties of solids at cryogenic temperatures; cryosars. Includes fundamental research and theoretical studies of semiconductors. For semiconductor devices, see Masers and lasers (20/E); /Electronic/ Components (9/A); and Energy Conversion (Field 10).
M. Thermodynamics	Thermodynamic theory, equations of state, free energy, enthalpy, entropy, thermodynamic cycles. Heat and heat transfer, including methods and apparatus for determining thermal radiation properties of materials (thermal emittance, reflectance, absorptance and transmittance; blackbody radiation). See also relevant Groups of substances, especially under Materials (Field 11). Low-temperature phenomena

GROUP	SCOPE
	and technology, excluding properties of solids at cryogenic temperatures, for which see Solid-state physics (20/L). Cryogenics, cryostats, cryopumping, etc. See also Physical chemistry (7/D).
N. Wave propagation	Generation, modulation, propagation, and scattering of electromagnetic waves, exclusive of those included in Optics (20/F). Includes radiofrequency spectroscopy.

21 PROPULSION AND FUELS

GROUP	SCOPE
. Air-breathing engines	Advanced engines which use ingested air to oxidize their fuel, e.g. the liquid air cycle engine (LACE). For conventional reciprocating and jet engines, see respectively, Reciprocating engines (21/G) and Jet and gas turbine engines (21/E).
. Combustion and ignition	Ignition, autoignition, starters, igniters, distributors, spark plugs, flame stability, combustion product studies, etc. See also Thermodynamics (20/M).
. Electric propulsion	All types of engines deriving power from free ions or electrons. Ion, plasma, arc-jet systems, etc.
. Fuels	Production, performance, storage etc., of all types of solid, liquid or gaseous fuels except those used in rockets. See also Chemistry (Field 7).
. Jet and gas turbine engines	All types of jet and gas turbine engines, including hydroduct, turboprop, etc.
. Nuclear propulsion	Nuclear devices for marine, ground, air, and space propulsion.
. Reciprocating engines	Reciprocating engines of various configurations for all types of propulsion. Includes steam engines.
. Rocket motors and engines	Rocket motors and nozzles, rocket motor cases, combustion chambers, and related subsystems. Propulsion hardware (propellant feed systems, tanks, injectors, pressurization systems, etc.)
. Rocket propellants	Production, performance, handling, and storage of chemical propellants and propellant combinations. Includes thermochemistry and chemical reaction kinetics of propellant combinations. Liquid, solid, and hybrid propellants, including rocket fuels, oxidizers, binders, plasticizers, additives, etc. See also Chemistry (Field 7).

22 SPACE TECHNOLOGY

Theory, design, tests, production, operation, and maintenance of all types of spacecraft, spacecraft components, and supporting facilities. See also Navigation, Communication, Detection, and Countermeasures (Field 17) and Propulsion and Fuels (Field 21).

GROUP	SCOPE
A. Astronautics	Orbital rendezvous, space stations, space exploration, operations in space, spacecraft operating problems, etc.
B. Spacecraft	Design and construction of spacecraft. Spaceships, space probes, space capsules, satellite vehicles, aerospace planes, and their components, accessories, auxiliary systems, etc.
C. Spacecraft trajectories and reentry	Determination, analysis, processing, etc. of spacecraft trajectory data. Orbital calculations, flight path analysis, reentry data, space mechanics, etc.
D. Spacecraft launch vehicles and ground support	Handling and launching including transportation, storage, preparation for launching, and countdown. Launching equipment, checkout equipment, ground support equipment and systems. Spaceports.

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